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I. NOTES ON THE EPITHELIUM LINING THE MOUTH OF NECTURUS AND MENOPOMA.

II. NOTES ON THE BLOOD-CORPUSCLES OF NECTURUS.

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It has always seemed to me worth while for American students to publish even small notes on characteristic American forms, if by so doing existing knowledge is increased or the statements and generalizations of European investigators, based almost necessarily, in great part, upon European material, may be corrected. The following notes are offered, hoping that they will answer one or both of the above requirements:

I.

In frogs, as is well known, a lining of ciliated epithelium covers the free surface of the mucous membrane of the mouth and œsophagus, and extends to or into the stomach. This is true also of a great many other Amphibia, and the generalization is made by Wiederscheim (*Lehrbuch der Vergleichenden Anatomie der Wirbelthiere*, Band II., page 583) and by Hoffmann, in the part, "Amphibia," of *Bronn's Klassen und Ordnungen der Thier-Reichs* (p. 383, 400), that a ciliated epithelium lines the mouth and œsophagus of all Amphibia (that is, frogs, toads and salamanders of all kinds).* Hoffmann, citing Leydig as authority, makes but a single doubtful exception. In the exceptional case, the epithelium is said to be, probably, ciliated with such fine cilia that they were not detected. Professor Owen (*Comparative Anatomy and Physiology of Vertebrates*, Vol. I., p. 435, 440) says, that ciliated epithelium is present in the mouth of most Amphibia and in the œsophagus of the triton, and of the larvæ (tad-poles) of frogs and toads.†

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* As the structural indications of a division into mouth and pharynx or throat, in most Amphibia, are very obscure, if present, the alimentary canal preceding the stomach is, in this paper, considered to be divided simply into mouth and œsophagus; the beginning of the œsophagus being indicated by the narrowing lumen and the beginning of the longitudinal folds.

† The statement of Prof. Owen is very meager, and neither makes a generalization nor admits of one.

As the three authors named stand very high as original investigators, as the work of one of them (Wiederscheim) was published in 1883, and as no original work upon this subject has been done, so far as I know, since their publication, their statements may be taken as representing the present state of knowledge upon the subject.

In Necturus, one of the water salamanders with permanent external gills, found in all the larger lakes and streams west of the Hudson River, the lining epithelium of the œsophagus is columnar and ciliated, but that lining the mouth is not a ciliated, but a stratified, pavement or transitional epithelium. The cells are very large and irregular, and possess a large nucleus which show quite clearly what is considered by many writers to be an intra-nuclear net-work, and also a clear zone (nuclear membrane) separating the nucleus from the cell-body. In *Menopoma*—the large water salamander without gills, found in the Alleghany and Ohio Rivers—the structure of the epithelium of the mouth and œsophagus is as described for *Necturus*.

While the facts presented in this paper show the danger of generalization with reference to a specific structure or function, unless all the facts that may support or overthrow the generalization have been critically investigated; they also suggest what seems to be a fruitful field of inquiry, viz., to see what mode of life or general advancement in structure is accompanied by a ciliated epithelium, both in the mouth and in the œsophagus, as in the frog; and also the conditions under which the mouth is lined by a non-ciliated, and the œsophagus by a ciliated epithelium. The mode of life and the structural conditions in *Necturus* and *Menopoma* point to the generalization that while in all Amphibia the œsophagus is probably lined with columnar ciliated epithelium, the epithelium lining the mouth is columnar and ciliated in the forms living mostly on the land or on the surface of the water, and into whose mouth water only occasionally finds access (frogs, toads, many salamanders); while in those like *Necturus* and *Menopoma*, living almost exclusively under water like a fish, the epithelium of the mouth is non-ciliated and stratified.

II.

[The publication of this paper is deferred at the request of Prof. Gage.—PUB. COM.]